

## CONCERNING THE NAME *FUCUS MUSCOIDES* (COTTON) J. FELDMANN *et* MAGNE

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**ABSTRACT** - *Fucus cottonii* (*nomen nov.*) is proposed to replace *Fucus muscoides* (Cotton) J. Feldmann *et* Magne (*nomen illeg.*). Reasons are presented to justify the continued recognition of the taxon *F. cottonii* as distinct from *F. vesiculosus* Linn. (including *F. balticus* C. Ag.). *Fucus cottonii* is an attached, usually vegetative, dwarf salt-marsh form, occurring as moss-like coverings in the supralittoral zone and with a distribution on the atlantic coast of France, Britain, Scotland, Norway, and western Ireland.

**RÉSUMÉ** - Le nom de *Fucus cottonii* (*nomen nov.*) est proposé à la place de *Fucus muscoides* (Cotton) J. Feldmann *et* Magne (*nomen illeg.*), et les arguments qui justifient la distinction de ce taxon d'avec *F. vesiculosus* Linné (ce dernier incluant *F. balticus* C. Ag.) sont présentés. *Fucus cottonii* est une forme naine de marais salés, fixée, ordinairement à l'état uniquement végétatif, formant des gazons denses dans la zone supralittorale; elle est présente sur la côte atlantique en France, Angleterre, Écosse, Norvège et Irlande de l'ouest.

**KEY WORDS** : *Fucus*, *F. balticus*, *F. cottonii*, *F. muscoides*, *F. vesiculosus*, salt-marsh.

### INTRODUCTION

Feldmann & Magne (1964) elevated Cotton's (1912) var. *muscoides* of *Fucus vesiculosus* Linn. to the species level, but in so doing they created a later homonym of *F. muscoides* Linnaeus (1753), the basionym of the rhodophyte *Acanthophora muscoides* (Linn.) Bory de Saint-Vincent (1828). Since *Fucus muscoides* (Cotton) J. Feldmann *et* Magne *nomen illeg.* continues to appear in recent literature (Cullinane, 1973; Parke & Dixon, 1976; Gallardo *et al.*, 1985; South & Tittley, 1986), it seems advisable to rectify this problem. We propose the name *Fucus cottonii* in honor of A.D. Cotton, who was the first to distinguish this alga as an entity. It is also appropriate to analyze the question whether the recognition of this entity as a distinct species of *Fucus* is justified.

## HISTORICAL BACKGROUND

The illegitimate name *Fucus muscoides* (Cotton) J. Feldmann *et* Magne was based on *Fucus vesiculosus* Linn. var. *muscoides* Cotton. Cotton (1912) described this variety as very dwarf, upright-growing form up to 5-6cm tall, with filiform branches, which are fastigiate and densely crowded together. The branches are cylindrical or compressed, 1-3mm wide, not twisted, with marginal cryptostomata. Receptacles are very scarce. The epithet "muscoides" refers to its moss-like habit.

## OBSERVATIONS

When Feldmann & Magne (1964) made the binomial *Fucus muscoides*, they included *Fucus vesiculosus* var. *balticus* in the sense of the Crouans (Crouan & Crouan, 1867). There are indeed some similarities between *F. muscoides* (now *F. cottonii*) and *Fucus balticus* C. Ag. [= *F. vesiculosus* var. *balticus* (C. Ag.) J. Ag.]. So it is necessary to clarify the relations of *F. muscoides/cottonii* with *F. balticus* on the one hand and with *F. vesiculosus* on the other hand.

### Relation to *Fucus balticus* C. Ag.

The name *Fucus balticus* originated with C. Agardh (1814), who described<sup>1</sup> it as "frons plana dichotoma obsolete costata, tuberculis marginalibus", citing a collection made by Stenhammar "in mare Baltico ad littus orientale Sveciae". C. Agardh (*in* Palmstruch, 1816, pl. 516, figs a, b, c & e) depicted his *Fucus balticus*. Later, C. Agardh (1817) recognized a number of varieties of *Fucus vesiculosus*, one being [zeta] *subecostatus*, which included his own *Fucus balticus* in taxonomic synonymy.

We have located two specimens attributable to *Fucus balticus* C. Agardh. In the Herbarium of Bory de Saint-Vincent in PC is a single specimen labeled "*Fucus Balticus* mihi". Additional etiquette indicates that it was collected "ad littora maris Balt." and sent by Hornemann to Bory de Saint-Vincent. The specimen itself is only 15mm tall. Kützing (1860) depicted *Fucus balticus* on the basis of authentic material then located in the Sonder herbarium. Mrs. D.M. Sinkora of the National Herbarium of Victoria has confirmed that such a syntype specimen is now in MEL.

In their extensive survey of salt-marsh Fuci in the British Isles, Baker & Bohling (1916) concluded that earlier records of *F. balticus* from the British Isles, such as by Greville (1826) and Batters (1890), were based on mis-identifications. They asserted that the name *Fucus balticus* is not applicable to any of the British salt-marsh Fuci.

<sup>1</sup> C. Agardh cited with a query *Fucus angulatus* of S.G. Gmelin (1768, p. 112). Gmelin listed "Mare mediterraneum" and "Anglieum" as the provenances of his *F. angulatus*; a description was provided, but no plate. The current status of *F. angulatus* is uncertain; it did not appear in Turner (1808-1819) nor in De Toni (1895, 1897-1903).

Baker & Bohling (1916) recognized within *Fucus vesiculosus* a section of loose-lying forms and a section of salt-marsh forms. Within the loose-lying forms they recognized ecad *subecostatus*, corresponding to the original *Fucus balticus*. Ecad *subecostatus* included plants that occur in the sublittoral of still water (e.g., the Baltic Sea), on the sea-bottom, from 8-20m depth and are always sterile. Svedelius (1901), Leving (1940), and Waern (1952) have provided accounts of this community. It is clear from the literature that *F. balticus* [= *F. vesiculosus* ecad *subecostatus*] is a non-attached form (Sauvageau, 1908) and thus separable from *F. muscoides sensu* Feldm. et Magne. The section of *F. vesiculosus* containing salt-marsh forms was comprised of three ecads: ecad *volubilis*, which included the relatively large, spirally twisted plants; ecad *caespitosus*, which included the turf-like plants (and those British collections previously mis-identified as *F. balticus*), and ecad *muscoides*, which included the filiform plants, that is, *F. vesiculosus* var. *muscoides* of Cotton (1912). Plants of ecad *caespitosus* were dwarf, prostrate or erect, showing little or no curling, lacking midrib and air-bladders, and with conceptacles sometimes with divided oogonia. Plants of ecad *muscoides* differed mainly by their erect growth, filiform axes, and very scarce receptacles. Newton (1931) recognized as many as eight varieties of *Fucus vesiculosus* besides the typical variety. One of these varieties was Cotton's var. *muscoides*, which formed dense mossy carpets and was known from Clare Island on the west coast of Ireland.

#### Relation to *Fucus vesiculosus* L.

From their studies of populations of *Fucus* growing in salt marshes on the northwestern coast of Spain, Niell *et al.* (1980) concluded that there was no reason to maintain as different species *Fucus muscoides*, *F. balticus*, and *F. lutarius* (Chauvin ex Kickx)<sup>2</sup> Kütz., another reduced form living in salt-marshes. By carrying out some morphological measurements they considered all such entities to be related by a gradual variation of characters and chose to include them within a megaecad *limicola* of the single species *F. vesiculosus*. These workers, however, did not take into account niche differences, such as location in the littoral zone and the corresponding duration of emersion, and other ecological features, such as occurrence on rocky or on moveable substrate, living in brackish conditions or in normal salinity, and degree of exposure to waves or completely protected. We are convinced that *Fucus muscoides sensu* Feldmann et Magne is distinguishable from *F. vesiculosus* on the basis of the former taxon occurring in protected brackish habitats at the uppermost supralittoral zone, forming dense mossy stands, or swards, with thalli of erect stature, dwarf (usually only 2-3cm tall, at times 5-6cm tall), having terete to somewhat compressed axes less 1-3mm wide, and almost invariably sterile. Figure 1 presents habit drawings of thalli of *F. muscoides* collected in the Orkneys, Scotland. In contrast, on the French Atlantic coast *Fucus vesiculosus* is a species characteristic of the midlittoral

<sup>2</sup> In his exsiccatae "Algues de Normandie", Chauvin distributed as No. 174 "*Fucus vesiculosus* var. *lutarius* nob.", but he did not validate this, even though he has been credited with it. Kickx (1856) validated *Fucus vesiculosus* [var.] *lutarius*, and Kützling (1860) treated this taxon at the species level.

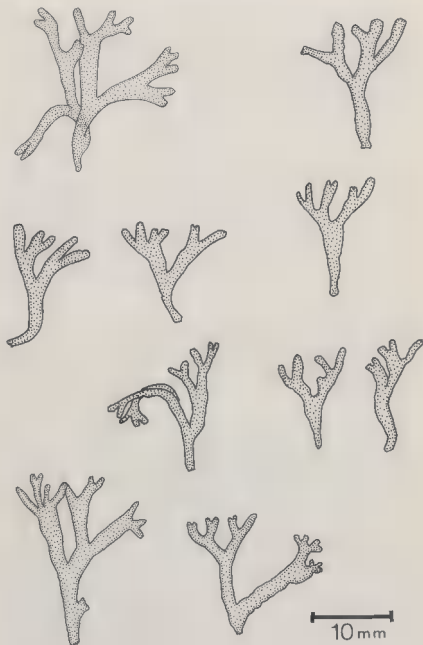


Fig. 1 *Fucus cottonii* Wynne et Magne [= *F. muscoides* sensu J. Feldmann et Magne]. Collection from Orkney Islands, Scotland. [MICH].

zone, restricted to rocky substrate, and experiencing moderate to heavy exposure to waves. Kjellman (1890) recognized *Fucus vesiculosus* [formal] *balticus*, which had no nomenclatural connection to *Fucus balticus* C. Agardh. Waern (1952, p. 167, footnote) stated that *F. vesiculosus* [var.] *balticus* Kjellm.<sup>3</sup> is "not to be confused with *Fucus balticus* C. Agardh, often called var. *balticus*, i.e. small loose-lying monstrosities of *Fucus vesiculosus*". Levring (1940) recognized *F. vesiculosus* on the south Swedish coast to be represented by [beta] *balticus* Kjellm., a variety containing as many as six formae in this flora. *Fucus balticus* C. Ag. (pl. 516, figs 1, b, c, & e in Palmstruch, 1816) was mainly included within f. *subecostata*, whereas a part of *F. balticus* (pl. 516, fig. d) was assigned to f. *filiformis*. Powell (1963) regarded it as nomenclaturally useful to refer to all of the submerged Baltic Sea forms of *F. vesiculosus* as f. *balticus* Kjellman.

The delineation of other species of *Fucus*, including *F. lutarius*, from *F. muscoides sensu* Feldmann *et* Magne will be detailed in the section on "Ecology" below.

#### Nomenclatural proposal

In light of the illegitimate status of the name *Fucus muscoides* of Feldmann & Magne (1964) and our conclusion that the recognition of this taxon is taxonomically defensible on both ecological and morphological grounds, the following name is proposed:

*Fucus cottonii* Wynne *et* Magne *nomen novum*

= *Fucus muscoides* (Cotton) J. Feldmann *et* Magne, 1964, p. 16.

= *F. vesiculosus* var. *muscoides* Cotton, 1912, p. 127, pl. VI, figs 1 & 2.

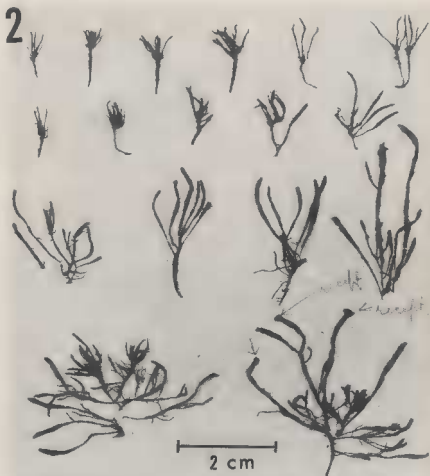
= *F. vesiculosus* var. *balticus sensu* Crouan & Crouan, 1867, p. 171; Crouans Alg. mar. Finist. no. 104, non *F. balticus* C. Agardh, 1814, p. 29.

The type specimen of *Fucus cottonii* is located in the British Museum (Tittley & Tyler, 1983), and it corresponds to Cotton's (1912) pl. VI, fig. 1. The type collection (Fig. 2) contains several specimens, and at least one of the specimens bears receptacles. Cotton (1912) stated that the receptacles were "very scarce", whereas we have never observed receptacles in our examination of populations from the French coast. The distributional range of *F. cottonii* is thought to include northern Spain, Atlantic France, western Ireland, England, Northern Ireland, Scotland, and Norway. Although Powell (1963) made no reference to var. *muscoides* in his treatment of speciation in the genus *Fucus*, the taxon was included in Parke & Dixon's (1976) check-list of British marine algae.

#### Ecology of *Fucus cottonii*

*Fucus cottonii* appears to be restricted to tidal marsh coasts of western Europe and occupies a quite characteristic habitat. It is this particular ecological trait that supports its distinction from other Fuci inhabiting salt-marshes. On the Atlantic coast *F. cottonii* occurs in protected salt-marsh ha-

<sup>3</sup> It should be pointed out that this name is pre-empted by the prior existence of *F. vesiculosus* var. *balticus* (C. Agardh) J. Agardh (J. Agardh, 1848).



CLARE ISLAND SURVEY.

MARINE ALGAE.

Fucus vesiculosus var. muscoides  
 Achill Sound, May 1911

photographed & illustrated in Report

Coll. and determ. A. D. COTTON, 1909-1911.

Fig. 2 - *Fucus vesiculosus* var. *muscoides* Cotton [= *Fucus cottonii* Wynne et Magne].  
 Type collection from Clare Island, Ireland. [in K-BM].

bitats under brackish conditions. Cotton (1912) depicted this taxon to form thick swards with scattered plants of the angiosperm *Statice maritima*. In western Ireland, de Valéra & Cook (1979) observed *Fucus cottonii* (as *F. vesiculosus* var. *muscoides*) to be a frequent inhabitant of certain shallow depressions in the close sward, accompanied by salt-marsh angiosperms. In the same area it could be found growing in an area of seawater seepage (de Valéra *et al.*, 1979). From the west coast of Norway, Jorde (1966) reported the occurrence of small populations of a dwarf fucoid, the individuals of which were attached by their bases in the ground of saline meadows, forming a dense moss-like cover on the muddy bottom in association with several phanerogams. On the basis of specimens from Lønninghaven we have identified *F. cottonii* from the west coast of Norway. Jorde felt that the dwarf fucoids she observed corresponded well with fucoids occurring in the Baltic, but she admitted that the Baltic fucoids were entirely detached and were submerged. It is our view that *F. cottonii* is distinguishable from the Baltic fucoids because of the upright growth of its erect fronds, its attached or embedded habit, and its supralittoral habitat.

On the Brittany coast of France, Feldmann & Magne (1964) stated that it occurs on salty soil at the uppermost tidal level along with the angiosperms *Juncus maritimus* and *Armeria maritima*. Figure 3 presents the vertical

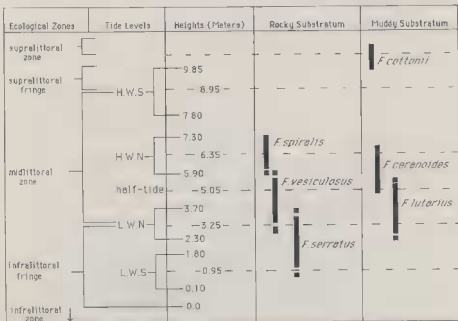


Fig. 3 - Vertical distribution of species of *Fucus* in the vicinity of Roscoff (Finistère), France. The species of the "Rocky Substratum" are restricted to moderate exposure.

distribution of the different species of *Fucus* occurring in the vicinity of Roscoff, Finistère, France. The parameters and terms are derived from de Beauchamp (1914) and Stephenson & Stephenson (1949). Figure 3 is based upon a teaching document for use in the courses at the Biological Station of Roscoff: it originated with J. Feldmann and was modified by L. and J. Ca bioch, and we have made additional alterations. The discrete ecological habitat of *F. cottonii* is demonstrated. *Fucus cottonii* is always an attached species, occurring on gravel and mud, thus moveable substratum rather than rocky/firm substratum. It is the highest-occurring species of *Fucus* in this habitat, located at the interface between the highest supralittoral zone and the subterrestrial zone, being emersed between 93 and 100% of the time on a daily basis. On the Finistère coast its cohorts include the angiosperms *Salicornia* and *Juncus*, the xanthophyte *Vaucheria*, and the cyanobacterium *Microcoleus*.

*Fucus ceranoides* Linn. is a brackish-water species, occurring on muddy substratum but occupying the mid- to lower littoral zone. It typically occurs attached by a disc to stones in the middle of channels draining the salt-marsh and thus tolerant to fresh-water during periods of low tide and to normal salinity during high tide. Powell (1963) characterized it as a species found in estuaries of rivers and streams. *Fucus ceranoides* can also be distinguished by its forked receptacles often being located at the bases of the plants (Hamel, 1931-1939).

The vertical range of *Fucus lutarius* (Chauvin ex Kickx) Kütz. has some overlap with that of *F. ceranoides*, although that of the former species extends relatively lower (Fig. 3). *Fucus lutarius* differs from both *F. cottonii* and *F. ceranoides* by its fronds always being free on the surface of the mud and by occurring under conditions of normal salinity. Davy de Virville (1944) distinguished *F. lutarius* from *F. vesiculosus* by the almost complete absence of vesicles in *F. lutarius*. In the very rare instance of vesicles being present, *F. lutarius* can still be distinguished by its narrow, spiralled fronds (vs. wide, flat fronds of *F. vesiculosus*) and the fact that the fronds of *F. lutarius* are not attached by a disc but embedded at the base in the mud.

Three other species of *Fucus* that can be found on the French coast are *F. spiralis* Linn., *F. vesiculosus*, and *F. serratus* Linn., all of which are species characteristic of rocky substrate rather than moveable substrate. The sequence of their vertical distribution conforms closely to that as documented for these same species in the British Isles (Lewis, 1964; Norton, 1985). Of these three, *F. spiralis* occurs relatively higher in the midlittoral zone, occupying the upper littoral, along with cohorts *Pelvetia canaliculata*, *Porphyra umbilicalis*, and *Lichina pygmaea*; but its usual zone is at a lower position relative to that of *F. cottonii*. *Fucus spiralis* f. *nanus* (Stackh.) Kjellm. can grow up to 5m above high-water mark and in high-level pools and becomes dwarfed with increased exposure (Irvine, 1982), possibly resembling *F. cottonii* in stature, but this former species occurs on exposed coasts (Børgesen, 1903; Irvine *et al.*, 1972).

One other reduced form, *Fucus chalonii* J. Feldm., occurs on the Atlantic coast of France. *F. chalonii* is known from a very limited range on the



Basque coast (Feldmann, 1941). While the species was recognized by Davy de Virville (1944), he pointed out that it may merely be an exposed-coast ecotype of *F. vesiculosus*. Powell (1963) regarded *F. chalonii* as falling within the form-range of *F. vesiculosus* f. *linearis* (Hudson) Powell. Although the typical variety of *F. chalonii* has a height of 15cm, its var. *minimus* J. Feldm. is only 1cm tall, thus in the height range of *F. cottonii*. But there is no reason to suspect that *F. cottonii* can be confused with *F. chalonii* var. *minimus*, since this latter variety lives in very exposed situations and is abundantly fertile (Feldmann, 1941).

#### Specimens of *Fucus cottonii* examined:

FRANCE: Terrénès, Finistère: 4.iv.1957, *J. Feldmann 9368* (Feldmann Hb. in PC); 22.vii.1954, *J. Feldmann 9041* (Feldmann Hb. in PC); L.iii.1967, *J. Feldmann 11385* (Feldmann Hb. in PC); 19.iii.1977, *J. Cabioch* (Hb. Cabioch, Roscoff). St. Pabu, Aber Benoit: 16.vii.1954, *J. Feldmann 9037* (Feldmann Hb. in PC); 2.iv.1957, *F. Magne 502* (Magne Herb., Paris); 15.iii.1963, *A. Dizerbo* (MICH). Le Faou: 28.viii.1957, *F. Magne 553* (Magne Hb., Paris). Rive de la Penfeld, Kervallon: *Cr. Alg. mar. Finist. 105* (PC; MICH). Le Loch de Crozon, Brest: 25.viii.1975, *G. Boalch 68* (Hb. Plymouth Laboratory; and = *Magne 2376* in Magne Hb., Paris).

ENGLAND: Isle of Wight, Bonchurch: 1810, Hb. G. Fleming (BM).

SCOTLAND: Argyll, Isle of Mull, Ann Leth-onn: 20.v.1967, *B.M. Mull Survey 1569* (BM); 21.viii.1966, *I. Tittley 514* (BM). Shetland Islands, Ballia Sound: 28.viii.1952, *R. Dennis* (KEW in BM). The Orkneys, Bay of Ireland, the Bush: L.ix.1977, *J. Cabioch* (Hb. Cabioch, Roscoff; MICH).

NORTHERN IRELAND: County Down, Carlingford Lough, Mill Bay: L.iv.1981, *O. Morton* (BM); Head of Dundrum Bay: IV.1902, *C. Wadell* (KEW in BM).

IRELAND: County Galway, Carraroe: 16.viii.1958, *J. Feldmann 9902* (Feldmann Hb. in PC); 16.viii.1958, *Y. Chamberlain 756* (BM). County Clare, Finavarra: 28.ii.1958, *F. Magne 2476* (Magne Hb., Paris). County Mayo, Clare Island District, Achill Sound: v.1911, *A.D. Cotton* (KEW in BM); Clare Island District, Bellacragher Bay: iii.1931, *L. Praeger* (KEW in BM).

NORWAY: Hordaland, Lønninghavn: 19.ix.1964, *J. Rueness* (Oslo Univ. Hb.).

#### ACKNOWLEDGEMENTS

We thank Dr. Jacqueline Cabioch for providing helpful ecological information. We are grateful to Mr. Stuart Honey (BM) and Dr. Françoise Ardre (PC) for helping us locate specimens and to Dr. Jan Rueness, Oslo, for the loan of a collection. Mrs. Doris Sinkora kindly confirmed the presence of *Fucus balticus* in MEL.

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